WE CLAIM:

1. A router, comprising:

a plurality of chassis, each chassis comprising a plurality of processing modules and a programmable interconnection module;

a data connection between each processing module on each chassis and the interconnection module on the same chassis; and

a data connection between the interconnection module on each chassis and the interconnection module on at least one other chassis.

2. A router as defined in claim 1, wherein the data connections between the processing modules on each chassis and the interconnection module on the same chassis are electrical and wherein the data connections between the interconnection modules on different chassis are optical.

3. A router as defined in claim 1,

wherein the interconnection module on each chassis includes a plurality of electrical input ports, a plurality of electrical output ports and a programmable switch fabric disposed therebetween, the switch fabric being capable of selectively establishing connections between individual ones of the electrical input ports and corresponding ones of the electrical output ports in accordance with a connection map respectively associated with said chassis.

4. A router as defined in claim 3, wherein the interconnection module on each chassis includes a signal conditioning module connected to the switch fabric in said interconnection module.

5. A router as defined in claim 3, wherein the switch fabric in the interconnection module on each chassis is adapted to provide signal conditioning functionality.

6. A router as defined in claim 3,

wherein each processing module on each chassis includes a plurality of electrical input ports, a plurality of electrical output ports and a processing fabric disposed therebetween.

7. A router as defined in claim 6,

wherein a subset of the plurality of electrical input ports of each processing module on each chassis is connected to a respective subset of the electrical output ports of the interconnection module on that chassis.

8. A router as defined in claim 7,

wherein a subset of the plurality of electrical output ports of each processing module on each chassis is connected to a respective subset of the electrical input ports of the interconnection module on that chassis

9. A router as claimed in claim 3, each chassis further including:

a plurality of optical input ports;

a plurality of optical output ports;

a plurality of optical-to-electrical conversion units, each optical-to-electrical conversion unit being connected between a respective one of the optical input ports and a respective subset of the electrical input ports of the interconnection module on said chassis; and

a plurality of electrical-to-optical conversion units, each electrical-to-optical conversion unit being connected between a respective subset of the electrical output ports of the interconnection module on said chassis and a respective one of the optical output ports.

10. A router as defined in claim 6, each chassis further including:

a plurality of network interface modules for interfacing with an external network, each network interface module being connected to one or more respective electrical input ports and one or more respective output ports of one or more of the processing modules on said chassis.

11. A router as defined in claim 10, wherein the network interface modules are line cards.

12. A router as defined in claim 1, wherein the data connections between the processing modules on each chassis and the interconnection module on the same chassis are low-bandwidth connections and wherein the data connections between the interconnection modules on different chassis are high-bandwidth connections.

13. A router as defined in claim 6, wherein the processing fabric on at least one of the processing

modules on at least one of the chassis is adapted to perform packet switching between the electrical input ports and the electrical output ports of said at least one of the processing modules.

14. A router as defined in claim 3, wherein the programmable switch fabric in the interconnection module on at least one of the chassis implements a fully non-blocking switch.

15. A router as defined in claim 3, wherein the programmable switch fabric in the interconnection module on at least one of the chassis provides loopback functionality.

16. A router as defined in claim 3, wherein at least one of the chassis further comprises a controller connected to the interconnection module on that chassis, for providing the respective connection map to the switch fabric.

17. A router as defined in claim 16, wherein the controller on at least one of the chassis is adapted to be controllable from a location remote to the router.

18. A router as defined in claim 1,

wherein the chassis are arranged in two or more clusters;

wherein each chassis in each cluster includes at least one port reserved for intra-cluster connections with chassis in said cluster and at least one port

reserved for inter-cluster connections with chassis in other clusters.

19. A router as defined in claim 1,

wherein the chassis are arranged in two or more clusters, each cluster including a chassis interconnection module connected to all the chassis in said cluster;

wherein connections between chassis of a particular one of the clusters are established through the chassis interconnection module of the particular cluster; and

wherein connections between each pair of clusters are established through the chassis interconnection modules of the clusters of said pair.

20. A router as defined in claim 19,

wherein the chassis interconnection module of each cluster is adapted to provide programmable connections between different chassis in said cluster and between the chassis in said cluster and the chassis interconnection modules of other clusters.

21. A chassis for use in building a scalable router, comprising:

a plurality of processing modules, each processing module including a plurality of electrical input ports, a plurality of electrical output ports and a processing fabric disposed therebetween;

a programmable interconnection module, including a plurality of electrical input ports, a plurality of electrical output ports and a programmable switch fabric disposed therebetween, for selectively establishing

connections between individual ones of the electrical input ports and corresponding ones of the electrical output ports in accordance with a connection map;

a data connection between each processing module and the interconnection module, whereby a subset of the plurality of electrical input ports of each processing module on each chassis is connected to a respective subset of the electrical output ports of the interconnection module on that chassis and whereby a subset of the plurality of electrical output ports of each processing module on each chassis is connected to a respective subset of the electrical input ports of the interconnection module on that chassis;

a plurality of optical input ports and a plurality of optical output ports, for external connection to one or more other chassis of the router;

a plurality of optical-to-electrical conversion units, each optical-to-electrical conversion unit being connected between a respective one of the optical input ports and a respective subset of the electrical input ports of the interconnection module; and

a plurality of electrical-to-optical conversion units, each electrical-to-optical conversion unit being connected between a respective subset of the electrical output ports of the interconnection module and a respective one of the optical output ports.

22. A chassis as defined in claim 21, further comprising:

a plurality of network interface modules for interfacing with an external network, each network interface module being connected to one or more

respective electrical input ports and one or more respective output ports of one or more of said processing modules.

23 A chassis as defined in claim 22, wherein the network interface modules are line cards.

24. A chassis as defined in claim 21, wherein said interconnection module includes a signal conditioning module peripheral to said switch fabric.

25. A chassis as defined in claim 21, wherein said switch fabric is adapted to provide signal conditioning functionality.

26. A chassis as defined in claim 21, wherein the processing fabric on at least one of said processing modules is adapted to perform packet switching between the electrical input ports and the electrical output ports of said at least one of the processing modules.

27. A chassis as defined in claim 21, wherein said programmable switch fabric implements a fully non-blocking switch.

28. A chassis as defined in claim 21, wherein said programmable switch fabric provides loopback functionality.

29. A chassis as defined in claim 21, further comprising a controller connected to said interconnection module, for providing said connection map to said switch fabric.

30. A chassis as defined in claim 21, wherein said controller is adapted to be controllable from a location remote to the chassis.

31. A method of upgrading a router including a plurality of original chassis, each original chassis comprising a plurality of processing modules and a programmable interconnection module, wherein a data connection exists between each processing module on each original chassis and the interconnection module on the same original chassis and wherein a data connection exists between the interconnection module on each original chassis and the interconnection module on at least one other original chassis, the method comprising:

providing at least one additional chassis, each additional chassis comprising a plurality of processing modules and a programmable interconnection module, wherein a data connection exists between each processing module on each additional chassis and the interconnection module on the same additional chassis;

establishing a data connection between the interconnection module on each additional chassis and the interconnection module on at least one original chassis;

establishing a data connection between the interconnection module on each additional chassis and the interconnection module on at least one other additional chassis.

re-programming the interconnection module on each of the original chassis.

32. A method as defined in claim 31, further comprising:

programming the interconnection modules of each additional chassis prior to the step of providing the at least one additional chassis.

33. A method as defined in claim 31, further comprising:

programming the interconnection modules of each additional chassis after the step of providing the at least one additional chassis.

34. A method as defined in claim 31, wherein establishing a data connection between the interconnection module on each additional chassis and the interconnection module on at least one original chassis includes establishing an electrical connection.

35. A method as defined in claim 31, wherein establishing a data connection between the interconnection module on each additional chassis and the interconnection module on at least one other additional chassis includes establishing an optical connection.